TRANSLATION ACES INC.
29 Broadway ◆ Suite 2301
New York, NY 10006-3279
Tel. (212) 269-4660 ◆ Fax (212) 269-4662

[Translation from German]

(51) Intl. Cl.: B 29 f, 1/00

FEDERAL REPUBLIC OF GERMANY

GERMAN PATENT OFFICE

(52) German Cl.: 39 a4, 1/00

(11) Letters of Disclosure 2,106,546

(21) Serial No.: P 21 06 546.3

(22) Appln. date: 11 February 1971

(43) Discl. date: 17 August 1972

...

(54) Title: **Process & Device for Injection Molding of Objects in Synthetic Material**

...

(71) Applicant: Ernst Mohrbach, 6661 Rieschweiler

...

(72) Inventor: Anonymity requested

C. Stoepel, Dipl. Eng., W. Gollwitzer, Dipl. Eng., Möll, Dipl. Eng.
Patent Attorneys,
Am Schützenhof, Landau (Palatinate)

10 February 1971

Ernst Mohrbach, Rieschweiler (Palatinate)

Process and device for injection molding of objects in synthetic material

---

The invention relates to a process and a device for injection molding of objects, for example shoe heels, in synthetic material.

Injection molding of synthetic material, which, superficially considered, would seem a simple process, upon closer examination involves a multitude of problems, all the more difficult because, at least heretofore, they have been inaccessible to theoretical analysis, and can really be solved only by the use of relevant practical experience. This applies especially to objects involving large concentrations of volume, such as for example the aforementioned plastic heels for footwear. The general rule is that the sprue must not be smaller in cross section than the greatest cross section of the part to be molded. To avoid a technically unacceptable enlargement of the sprue, the injection molds are provided with displacement bodies, which form a sort of cavity. Connection of the displacement body to a surface on the outside wall of the mold forms an opening that renders very difficult the attachment of fastening means for the lift or attachment to the shoe. Providing webs or ribs to accommodate the fastening

means leads firstly to an undesirable volume concentration, and secondly to complications in the mold that yield unmolding difficulties.

As a general rule, the process of injection involves introducing a certain quantity of injection compound into the mold during a suitable injection time, and supplying additional material to the mold in an ensuing finishing period so as to produce an acceptable molded object having no cave-ins due to the extraordinarily pronounced contraction of the material during the cooling process, which may amount to as much as 40% of the volume. Just the appropriate dimensioning of the finishing time and pressure is very difficult and, as aforesaid, hardly accessible theoretically.

Especially the dimensioning of the sprue cross-section is very difficult, as the melt tends to 'freeze in' during the finishing phase.

Here, those skilled in the art must rely on the practical experience gained, which in turn may vary widely, depending on numerous factors.

The object of the invention, then, is to find ways and means of producing an object as an injection molding, especially when of large volume, in an acceptable manner, without requiring a complicated mold structure and the performance of as complicated an injection operation as has been practiced hitherto, with precisely dimensioned injection time, finishing time, under as precisely dimensioned pressures, temperatures etc.

The invention solves the problem posed by a process for injection molding of objects in synthetic material in which, after injection of the compound into the mold during the injection period provided, compressed air is supplied to the low-

viscosity center of the molding, its so-called plastic core, in the finishing period. Surprisingly, it has been found that a clean hollow object is formed in this way, its wall thickness fairly uniform in all areas.

If desired, depending on conformation and function of the injection-molded object produced, the cavity formed may be filled with foamed synthetic material.

In the first place, this eliminates the difficulties of mold construction, which consisted in providing suitable cores which in turn would lead to about the same wall thickness everywhere, which cores, since they must after all be connected to the mold somewhere, again complicate and compromise the conformation and function of the object produced. Furthermore, the stubborn problems involved in the finishing pressure using materials to be injected are eliminated. Finishing pressure using a gas, preferably air, is far simpler to control than finishing pressure using injected material.

The device for practicing the process according to the invention consists essentially of an injection mold with injection duct and an additional duct for supplying the gaseous medium, with opening protruding into the area of the low-viscosity center of the molded object.

Preferably this duct is arranged in the cover of the mold and oriented in the direction of the opening and closing action of the cover. Here, in other words, the mold requires no complicated cords or the like. This also simplifies the process of ejection and the means required for this purpose. A simple ejector ram will suffice.

Other features of the invention and details of the advantages thereby gained will appear from the following description of a mold, represented schematically and merely by way of example in the accompanying drawing, for production of a shoe heel of synthetic material by injection molding using the new process.

The mold consists, as usual, of a mold proper 1 and a cover 2. The mold is represented in closed condition. The injection duct 3 with passage 4 to supply the previously heated and plasticized material into the interior of the mold passes through the cover 2.

The cover 2, in further accordance with the invention, is equipped with a duct 5 and a matching connection 6 for supplying compressed gas, generally compressed air, the duct 5 projecting into the interior of the mold in an area where the low-viscosity center, the so-called plastic core of the molding, is to be expected upon performance of the injection molding operation.

Now according to the invention, then, after the first period of injection and in the ensuing finishing period, injection material is no longer forced through the duct 3, but air is forced through the duct 5. This is followed by the formation of a cavity 7 in the injection molding 8 formed, for example, as shown in the drawing, the heel of a shoe. As extensive experiments performed have shown, surprisingly enough, an approximately uniform wall thickness is obtained over the entire periphery of the molding. A corresponding cavity is formed in the interior. In the first place, therefore, the operation of injection itself can be greatly simplified. Similarly, the construction of the mold is simplified. As may be seen

in the drawing, no cores or the like are any longer required. This in turn simplifies the ejection mechanism. In the example shown, a simple ejector 9 is provided.

The finished product, namely, in the embodiment chosen by way of example, the heel 8, has a closed surface of adequate wall thickness round about, so that upon attachment of the lift to its under side in the first place and its connection to the shoe on top in the second place, there are no cavities to be dealt with corresponding to ribs or the like distributed in said cavities.

Optionally, depending on the configuration and function of the injection molding, it is possible also to fill up the cavity formed in the low-viscosity center with foamed synthetic material. This, too, entails no inconvenient complication of the entire operation, and is still far simpler than conventional methods. The new process moreover facilitates injection molding operations using multiple molds, which, as will be immediately apparent, lent themselves still less to solution of past problems, in particular those of pressure measurements, than simple molds.

Claims

1. Process for injection molding of objects in synthetic material, characterized in that after injection of the compound into the mold within the injection time provided for the purpose, compressed gas, preferably compressed air, is supplied to the low-viscosity center of the molding in the ensuing finishing period.

2. Process according to claim 1, characterized in that the cavity formed in the injection molding during the finishing period is filled with foamed synthetic material.

3. Device for practicing the process according to claim 1 or 2, consisting of an injection mold with injection ducts, characterized in that an additional duct is provided for supplying the gas under pressure and connected to a suitable source of gas, its orifice projecting into the area of the low-viscosity center of the molding.